Strategic Mobility 21

Economic Feasibility Analysis Report

Contractor Report 0007

Prepared for:

Office of Naval Research
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Arlington, VA 22203-1995

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Strategic Mobility 21 (SM 21) is a multi-year functional equivalent of a DoD JCTD of advanced logistics concepts, using Southern California Logistics Airport (SCLA), a 5,000+ acre multi-modal inland transfer facility and warehouse & distribution center complex in Victorville, CA as an integrated demonstration platform prototype for dual military and commercial use. This multi-disciplinary analysis provides an objective examination of the economic and operational feasibility of a shuttle train intermodal rail operation under various scenarios connecting the San Pedro Bay port complex and SCLA. The shuttle train is one element of an Agile Port System (APS) combining an efficient marine terminal, dedicated freight corridor and integrated inland facility. The business and cost model described in the analysis is presented within the operational context of a long haul main line transcontinental rail network linking regional and national goods movement patterns. The potential role of SCLA in alleviating projected future shortfalls in regional main line and intermodal rail capacity is also addressed.

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Subject: Deliverable Number 0007, Economic Feasibility Analysis Report

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Dear Paul,

In accordance with the requirements of referenced contract, we are pleased to submit this Economic Feasibility Analysis Document for your review.

Your comments on this document are welcomed.

Regards,

Dr. Lawrence G. Mallon
Strategic Mobility 21 Program Manager

cc: Administrative Contracting Officer (Transmittal Letter only)
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TABLE OF CONTENTS

LIST OF FIGURES

ABSTRACT

Strategic Mobility 21 (SM 21) is a multi-year functional equivalent of a Department of Defense Joint Concept Technology Demonstration of advanced logistics concepts. SM 21 has been provided the use of Southern California Logistics Airport (SCLA), a 5,000 plus acre multi-modal inland transfer facility and warehouse and distribution center complex located at the site of the former George Air Force Base in Victorville, California as an integrated demonstration platform prototype for dual military and commercial use.

As part of that effort, this multi-disciplinary objective analysis provides an objective examination of the economic and operational feasibility of a shuttle train intermodal rail operation under various scenarios connecting the San Pedro Bay port complex and SCLA. The shuttle train is but one element of an Agile Port System (APS) combining an efficient marine terminal, dedicated freight corridor and integrated inland facility designed to enable both rapid deployment of military equipment through Southern California strategic ports without conflicting with the movement of commercial freight, while at the same time supporting a viable regional strategy for regional goods movement maximizing and optimizing and synchronizing the use of existing rail main line and intermodal rail on dock marine terminal throughput capacity. Secondarily, the analysis applies value stream analysis as a value proposition of the benefits from regional goods movement synchronization to individual shipper distribution network efficiency, velocity and visibility from the maximization and synchronization of intermodal on dock and main line rail capacity.

The business and cost model described in the analysis is presented within the operational context of a long haul main line transcontinental rail network linking regional and national goods movement patterns. The potential role of SCLA in alleviating projected future shortfalls in regional main line and intermodal rail capacity is also addressed.

1.0 BACKGROUND AND PURPOSE

The Southern California Agile Supply Network (SCASN) now represented in a time domain business process reference simulation model is an aggregated distribution network comprised of surface transportation infrastructure (ports, marine terminal facilities, intermodal rail facilities, warehouse and distribution facilities, main line rail network, and interstate and major arterial highways) on which shippers (importers and exporters) and carriers exploit multiple distribution lanes combining the use of this infrastructure to create routing alternatives to effect the most efficient and cost-effective means to move ever growing volumes of freight and avoid bottlenecks and network disruptions both physical and man made.

The Strategic Mobility 21 (SM 21) program is an outgrowth of the Agile Port Demonstration Project (APS) sponsored by the Center for Commercial Deployment of Transportation Technologies (CCDoTT) at California State University Long Beach. An Agile Supply Network in a generic sense is based upon the premise that a marine terminal is but one node in a complex interdependent network of nodes and arcs representing surface transportation infrastructure. Each node and arc interacts with the others in the physical, functional, information and social *domains* through information flow, physical movement of freight and physical and social interaction among other network elements.

In turn a marine terminal and other nodes are comprised of multiple queues (berth, on dock rail, container yard, container freight station, gate) each with their own servers, wait times, dispatch or business rules etc. An Agile Port System is based upon the premise that in order to increase throughput capacity most of the functions performed at a marine terminal can be moved inland except for the essential vessel berth queue. It is comprised of an efficient marine terminal in terms of functional business process, a dedicated arc (truck lane, main rail line, MAGLEV, etc.) and an inland facility capable of serving as a logistics buffer for the marine terminal to synchronize both inbound import and outbound export or military deployment movements.

The SM 21 program is stood up to undertake APS modeling and simulation, collaborative shipper-carrier experimentation, network design, education training and exercise-demonstration design and execution built around the APS paradigm and its military Deployment and Distribution Enterprise paradigm counterpart the Joint Power Projection Support Platform (JPSP) combining the dual use APS system elements with essential military capabilities for mission execution.

The San Pedro Bay ports combined 2020 Plan and Master Rail Plan call for an optimal thirty percent net throughout of import cargo through the use of on dock or near dock rail
30% on dock rail to minimize unnecessary network dray movement by truck. A SM 21 report based upon a Value Stream Analysis of an end to end business process for a major importer-exporter similarly demonstrated that maximum use of on dock rail has the most potential for meeting anticipated future volumes of freight movement through the San Pedro Bay ports while at the same time serving as the most cost-effective distribution lane for major shippers for freight destined for inland locations.

The SM 21 program has been given the use of the former George Air For Base now redesignated the Southern California Logistics Airport (SCLA), an eventual 50,000 acre combined multi-modal transfer facility including industrial airport, intermodal rail facility, integrated warehouse and distribution facilities for modeling and simulation, shipper-carrier experimentation, joint logistics education and training, and demonstration planning and execution purposes. This will translate into a paradigm shift in which outbound export movements utilize pull rather than push logistics from Power Projection Platforms (PPP's) or military installations with rail ramps to deconflict long haul rail movements and port operations by reducing dwell time and footprint, and synchronize inbound import movements by pulling destination dependent blocks rather than full unit trains from marine terminals using the inland facility as a logistics rail buffer with sufficient storage and working track to take pressure off the rail main line and existing intermodal rail facilities to maximize system throughout capacity.

Within this context this report is intended to provide objective strategic insight for further in depth analysis into alternative market-driven operational scenarios for the potential dual use of the Southern California Logistics Airport at the site of the former George Air Force Base located in Victorville, California for the multi-purpose of supporting military and commercial logistics operations.

In the Southern California region throughput demand for surface transportation infrastructure is driven equally by population growth and international trade. Total throughput demand at the combined San Pedro Bay ports has been growing at a consistent double digit rate for over a decade and, even with alternate routes or distribution lanes coming on line, is expected to continue unabated. The Los Angeles Customs District is the nation's largest, measured both as the number of containers handled and the value of trade. Over 11% of the nation's trade (by value) passes through the region and collects over 37% of the nation's import duties.

TWO RECENT REPORTS BY THE CALIFORNIA MARINE AND INTERMODAL TRANSPORTATION SYSTEM ADVISORY COUNCIL [1] AND THE FINAL GOODS MOVEMENT ACTION PLAN RELEASED BY THE DEPARTMENT OF BUSINESS, TRANSPORTATION AND HOUSING [2] BOTH PROVIDE POLICY AND INFRASTRUCTURE INVESTMENT PRESCRIPTIONS TO MEET GOODS MOVEMENT THROUGHPUT DEMAND FUELED BY POPULATION GROWTH AND INTERNATIONAL TRADE WITHOUT COMPROMISING QUALITY OF LIFE AND ENVIRONMENTAL MITIGATION DEMANDS OF CALIFORNIA CITIZENS AND RESIDENTS. DR. JOHN HUSING OF THE UNIVERSITY OF REDLANDS HAS BEEN STUDYING EMPLOYMENT TRENDS IN SOUTHERN CALIFORNIA FOR OVER A DECADE. HIS FINDINGS HIGHLIGHT THE IMPACT OF TRADE AND LOGISTICS DRIVEN UPON REGIONAL EMPLOYMENT ACROSS ALL SECTORS FROM HIGH SCHOOL GED EQUIVALENT TO UNDERGRADUATE, GRADUATE AND PROFESSIONAL PAYING ON AVERAGE 16% OR MORE ABOVE MEDIAN WAGES AND THE SHIFT IN THE LOCUS OF FUTURE EMPLOYMENT TO THE INLAND EMPIRE OF SAN BERNARDINO AND RIVERSIDE COUNTIES ACCOMPANYING THE GROWTH OF WAREHOUSE AND DISTRIBUTION ACTIVITIES WITHIN THOSE AREAS. [3] GIVEN THE INTERDEPENDENCY OF REGIONAL EMPLOYMENT AND ECONOMIC GROWTH, ACHIEVEMENT OF THESE CONFLICTING OBJECTIVES WITHIN A MARKET DRIVEN CONTEXT IS A FUNCTION OF ECONOMICS.

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[1] Growth of California Ports: Opportunities and Challenges A Report to the California State Legislature April, 2007
[2] Final California Goods Movement Action Plan Department of Business, Transportation and Housing January, 2007
[3] Logistics Employment Growth, Inland Empire, 1990-2005 Dr John Husing PhD

1.1 Southern California Gateway: Global trade driving increased demand for intermodal freight throughput at San Pedro Bay ports

Total throughput demand at the combined San Pedro Bay ports has been growing at a consistent double digit rate for over a decade and, even with alternate routes or distribution lanes coming on line, is expected to continue unabated. The Los Angeles Customs District is the nation's largest, measured both as the number of containers handled and the value of trade. Over 11% of the nation's trade (by value) passes through the region and collects over 37% of the nation's import duties.

The Ports of Los Angeles and Long Beach, individually, were the 8th and 12th largest container ports in the world in 2004. Combined, they currently rank 5th, after Hong Kong, Singapore, Shanghai, and Shenzhen. The two ports handle 40 percent of all US containerized imports, including 70 percent of all the container imports arriving from Asia. It is estimated that jobs linked to international trade numbered 405,000 in 2005 for the five county Southern California region.

The traffic at these ports over the past 11 years has grown considerably, as illustrated in Table 1.

Year	Los Angeles	Long Beach
2006	8.429	7.296
2005	7.485	6.710
2004	7.321	5.780
2003	7.179	4.658
2002	6.106	4.526
2001	5.184	4.463
2000	4.879	4.601
1999	3.829	4.408
1998	3.378	4.098
1997	2.960	3.505
1996	2.683	3.067
1995	2.555	2.844

Source: Ports of Los Angeles and Long Beach

Figure 1: Yearly TEUs (in millions)

The growth in containers between 1995 and 2006 was 192% for the two ports combined, a 16% average annual increase. The Ports' long term forecast predicts San Pedro Bay port traffic at 20.35 million TEUs in 2010, 27.09 million TEUs in 2015, 36.20 million TEUs in 2020, and 42.53 million TEUs in 2030 (Parsons Transportation Group, 2006).

The channel depth and other facilities at the Ports of Los Angeles and Long Beach make them natural ports of call for the large ships that are currently facilitating international trade. While the San Pedro Bay Ports have a comparative advantage in attracting these large ships and are

efficient at unloading the ships, the unprecedented numbers of containers have placed great strain on the transportation infrastructure outside of the port. An 8000 TEU ship would generate 4,444 containers. The conversion factor for a container is 1.80 TEUS based on the marine container length mix of 20’, 40’, and 45’ units. If placed end to end, the length of containers on an 8000 TEU ship would stretch for more than 30 miles. The intermodal segment (direct ship to rail) of traffic on such a ship would generate 7.5 trains of 250 containers each. To continue to serve these ships it is necessary to examine more efficient (and cleaner) ways of moving goods inland from the Ports. For this study, we will focus primarily on import goods moving inland, which comprise roughly 75 percent of all containers handled at the Ports. We will evaluate the costs of operating a rail shuttle between the San Pedro Bay Ports and Victorville.

The 2020 Plan for the Ports of Los-Angeles- Long Beach and other studies all posit increased use of on or near dock rail as the most cost-effective and environmentally preferable means of moving the more than half of all import containers destined for locations beyond California’s borders. Major limiting factors impacting the maximum utilization of on dock or near dock rail throughput capacity include commercial practices which dictate the formation of destination dependent unit trains at on dock or near dock marine terminals (including necessary rail car switching until sufficient “blocks” of rail cars for major destinations are formed), available hours of operation for on dock rail operations, intermodal rail facility capacity, main line track capacity, and in the case of the TRANSCON line up the Cajon Grade required train separation and grade dependent limits on train separation and bi-directional unit train movement. In addition, train crews are organized by geographic sector such as Barstow, CA or Clovis, New Mexico also dictating where destination dependent unit trains are formed. For these reasons unit trains to related destinations of at least six thousand feet in length are most efficient from a rail operational perspective in that they absorb the same main line capacity as smaller unit trains, or METROLINK or AMTRAK passenger trains.

From a rail operational cost perspective each “lift” of a container on or off a rail car may cost as much as $450, operational scenarios that minimize additional lift requirements, while leveraging blocks of rail cars for a single or related destination in the formation of a unit train is optimal. Better yet, adoption of best commercial practices in which blocks of containers for a single are pre-stowed on board a vessel and then lifted one time on board a rail car block on or near dock to for a single destination dependent unit train is optimal from a rail system capacity utilization perspective. Incorporating blocks from a single or multiple ocean carriers (e.g. Alliance carriers) and from one or multiple terminals into a single destination dependent unit train will optimize the use of both current and future on or near dock as well as main line rail network capacity and therefore regional throughput overall.

This best commercial operating practice does not have to be effected at a single or even multiple marine terminal or near dock rail facilities which are reaching their design capacity. “Block swapping” or combining multiple rail car blocks and then switching or sorting (but not re-lifting) them by final destination already goes on at Clovis, New Mexico for example. This could easily be done at Victorville remembering that it is located in the middle of several train crew districts as easily as anywhere else on the rail transcontinental main line. This is in principle and practice what we refer to as a rail shuttle operation that does not do violence to current rail system operations east of California. This business model with multiple variations will serve as the central model for both import inbound rail movement and outbound export and military

deployment movement from the Southern California Logistics Airport facility at Victorville, CA for purposes of this study.

The economic costing element of this report is provided in order to capture rail rates for the movement segment between the San Pedro Bay Ports and Victorville, California for each scenario. In some scenarios, the full rate could include a rail component cost beyond Victorville to points outside California. The San Pedro Bay to Victorville portion should be viewed as a stand-alone cost and when added to that part beyond Victorville constitutes the entire rail cost for any given rail movement – thus a joint rate. The cost is dependent on the use to be made of Victorville. By isolating each scenario dependent use, one can compare mode costs.

1.2 On Dock Rail Value Stream Analysis

In light of the importance of increased use of on and near dock intermodal rail to maximizing regional goods movement throughput capacity utilization, SM 21 in an independent Value Stream Analysis of a single large shipper with an integrated distribution network investigated and documented the value proposition of intermodal rail, and related business process synchronization (regional dwell time/demurrage reduction, local dray regional appointment and scheduling system and third party monitoring) to a single distribution network with both local and national distribution trade lane components. CMTC, Inc, a non-profit affiliate of the National Institutes of Standards and Technology (NIST) of the US Department of Commerce was commissioned to undertake this effort.

In 2004, the cost of the business logistics system in the United States increased to $1,015-billion, or the equivalent of 8.6 percent of nominal Gross Domestic Product (GDP). Inventory carrying costs rose to 10.6 percent in 2004, surpassing the 2001 level. Inventory investment in 2004 was $133 Billion higher than 2003. The industry's capacity problems contributed to the build up of inventory.

According to the CCSMP 16th annual state of logistics report, shipment of containers represents the greatest security risk in our cargo supply chain. Ocean cargo container security ranks as the number one concern among supply chain executives at the largest global import and export companies as reported by A.T. Kearney. Shutting down a port because of a terrorist threat would have wide ranging economic implications. The labor shutdowns at west ports in 2002 cost about $1-billion per day in lost commerce.

The Dole Value Stream Analysis began with the Current State of representative distribution lane shippers (e.g., Port of Los Angeles - Pier 400, landbridge, transload, regional warehouse/distribution centers, store door). This included distribution process mapping for select Dole Packaged Goods' product family beginning from when the product arrives at the Port of Los Angeles till transported both inland to the Buena Park distribution center and transported south via rail to the F.T Worth Texas distribution center.

The primary objective of the Value Stream Analysis is to facilitate the identification and help prioritize future implementation of improved process flows and cost control. The secondary objective is to raise the consciousness in every firm and function of the effect of its actions on

every other firm and function touching the value stream. This is being accomplished through the Value Stream Analysis transformation for Dole's transportation supply chain starting from vessel arrival at Pier 400 (Port of Los Angeles), traveling inland by truck to the Buena Park California distribution center, and south by rail to the F.T. Worth Texas distribution center.

Maersk APM Terminals is the main US-based unit of Denmark based container shipping company Maersk Line, which itself is a subsidiary of A.P. Moller – Maersk. Maersk, Inc., serves as an agent for its parent, handling land-based services for Maersk Line vessels from a network of about 100 offices in the US, Canada, Central America, and the Caribbean. Maersk APM Terminal customers represent 60 of the world's leading container ship lines who shipped 24 million containers (Twenty-foot equivalent unites – TEU) through Maersk APM Terminals in 2005.

The Value Stream Analysis methodology applied to this effort is a derivation of Value Stream Mapping as pioneered by Womack & Jones of the Lean Enterprise Institute (LEI) [2]. There are over five organizations connected to the Dole Value Stream Analysis Current State, emphasizing both agility (flexibility) and waste reduction.

The Value Stream Analysis identifies the flow of information and material between "up and down stream" customers. It identifies the waste and value in processes and enables employees to think in terms of:

- Processes, Not Products or Functions
- Mapping Flow of Materials and Information between your "up and down stream" internal and external customers
- Value Creation & Not Price
- Maximizing Supply Chain Relationships & Security
- Waste Removal Through Continuous Improvement
- Assigning Costs to Activities (not resources)

The future state implementation of TO-BE improvement projects as prioritized through the Value Stream Analysis places heavy emphasis on maximizing the use of on dock intermodal rail, its bottlenecks, and associated expenses up and down the supply chain. Since there is a 1:1 correlation between Lead Time reduction and Days of On-Hand Inventory, we can very quickly see that a 10-day bottleneck can translate into a huge expense of tied up working capital costs. In addition, if a business is able to get their products through the system to the customer more quickly, then it can establish a competitive advantage.

In the follow-on SM21 project, we would like to drill further down vertically into the existing Dole transportation supply chain to get to the level of the import manager and quantify what is truly value added. Secondly, we would like to drill further down horizontally into the individual supply chains to begin to show the impact of aggregation. This consists of quantifying the primary bottlenecks associated with the use of on dock intermodal rail, reduction of dwell times, cycle times, and improvement via an effective regional local dray scheduling and appointment system for the facilitation of draymen scheduling at the gate queue. It is important to note that maximizing use of regional on dock intermodal rail is particularly relevant to the potential impact of introduction of Southern California Logistics Airport (SCLA) at Victorville, California

as an integrated element in trade distribution lanes in helping to reduce dwell times and cycle times down stream from the port.

2.0 CAPTURING MARKET SHARE: DISTRIBUTION OF FREIGHT BY MODE OR DISTRIBUTION LANE

Without a strategic business model and strategy, SCLA Victorville might as well be Barstow, CA or Clovis New Mexico where Transcontinental rail traffic is sorted for Chicago and Dallas. Successfully implementing this business model means capturing a reasonable market share of the total percentage of the roughly 75% or so of total regional port container throughput that moves inland by rail. Whether it be primarily transload or intermodal rail movement, or a mix of the two, the SCLA facility is projected at 1.5 million lifts per year on 430 acres eventually scalable to 5 million lifts per year. To this end we will evaluate the costs of operating a rail shuttle between the San Pedro Bay Ports and Southern California Logistics Airport at Victorville, CA. In addition to eastbound intermodal or transload activity, half of the efficient distribution logistics equation is equipment management. Given the imbalance between import and exports through the San Pedro Bay ports, SCLA Victorville can serve as a logistics buffer through an equipment pool to synchronize empty sea container, chassis, trailer, and domestic container movement back to the marine terminals along with exports to maximize on dock or near dock rail efficiency and rail main line and intermodal rail yard capacity.

Fortunately for SCLA current regional planning favors rail over truck movement for environmental and community impact reasons. All else being equal, rail transport is environmentally cleaner in an aggregate air quality emission sense than truck transport and has the greatest upside potential for more efficient goods movement out of the ports. Containers that move directly by rail have average dwell times at the marine terminal of less than 24 hours versus three days for containers moving via truck.

Containers moving by rail from the ports can either move via on-dock, near-dock, or off-dock rail facilities. Containers moving by truck may be transported locally by dray, long-haul truck, or trans-loaded from a twenty or forty foot sea container to fifty-three foot domestic container or trailer for truck or rail movement to final destination. Descriptions of the modes and distribution lanes as well as their relative proportion of total import container movements follow.

- On-dock rail: estimated at 24 percent of import moves. Currently eleven container terminals at the Ports of LA and LB have on-dock rail facilities. It is expected that the amount of traffic utilizing on-dock rail will continue to grow as container volumes grow at the ports and infrastructure continues to grow, however it is not clear whether the percent traveling on-dock will eventually comprise the majority of rail moves from the Ports due to the large anticipated increases in containers at the ports.

- Near-dock rail (defined as being situated within 5 miles of the port): estimated at 8 percent of import moves. Near-dock refers to short haul drays to the intermodal railyard operated by Union Pacific, the Intermodal Container Transfer Facility, “ICTF”. ICTF has a capacity of approximately 760,000 lifts per year or 1,368,000 TEUs (source: UPRR). Union Pacific has plans to expand ICTF to achieve 1.5 million lifts or 2,700,000

TEUs per year at a cost of $100 million (source, UPRR). Another near-dock intermodal facility, the Southern California International Gateway, “SCIG”, is planned by BNSF. If constructed, the opening date is planned for late 2011. It will be situated four miles from the ports. The estimated cost of this project is $200 million and it is anticipated that the capacity will be 1.5 million lifts or 2,7000,000 TEUs per year (source: BNSF) .

- Off-dock rail (defined as being situated more than 5 miles from the port): estimated at 10 percent of import moves. This traffic is typically drayed to the downtown rail yards, particularly the BNSF’s Hobart rail facility, which is situated 20 miles from the ports. In calendar year 2006, Hobart Yard loaded 35 percent of BNSF’s international containers (BNSF does not operate a near-dock facility). The balance, 65 percent, were loaded on-dock.

	Off-dock	Near-dock	On-dock
BNSF	35%	-0-	65%
UPRR	14%	40%	46%

Figure 2: Railroad Loading Locations

- Local trucking: estimated at 23 percent. This traffic is primarily comprised of drays to destinations in Los Angeles county.

- Regional trucking: estimated at 20 percent of import moves. This traffic is primarily comprised of drays to the “Inland Empire,” (San Bernardino and Riverside Counties).

- Transloading: estimated at 15 percent (11 percent rail and 4 percent truck) of import moves. This consists of draying containers to warehouses (typically inland) where the contents of 20 or 40 foot containers are moved to larger containers (typically 53 foot) to take advantage of economies of density in rail and trucking. This percentage may, in fact, be higher than 15 percent, since some of the freight categorized in the local and regional trucking categories may ultimately be transloaded.

(Source, CCDoTT, 2006; author’s calculations from POLB and POLA 2006 data)

Direct Ship to Rail	42%
Local Trucking	23%
Regional Trucking	20%
Transloaded Containers	15%
Total (all categories)	100%

Figure 3: Distribution of San Pedro Bay Port Container Traffic

3.0 POTENTIAL RAIL SHUTTLE OPERATION BUSINESS MODEL AND DISTRIBUTION LANES

The principal difference between a primarily intermodal and transload operation is that the shuttle operation involves only rail movement through SCLA. Transload activity involves a dray movement to regional warehouse facility followed by a secondary trailer or domestic container movement to SCLA in combination with a domestic intermodal rail movement to an inland rail destination followed by a further truck movement to final destination. Transload operations open the door to fulfillment center, postponement and localization value added logistics services emerging within the SCLA complex.

In either case for this market analysis, we will focus primarily on import goods moving inland, which comprise roughly 75 percent of all containers handled at the Ports. We will evaluate the costs of operating a rail shuttle in comparison to inland truck movement between the San Pedro Bay Ports and Southern California Logistics Airport at Victorville, CA.

As used herein, a rail shuttle is a relatively short haul operation between origin and destination points or the sub-part of a longer haul. In the latter case, there would be work performed at the shuttle destination point before transport continues to a final rail destination.

From a rail operations perspective, short trains absorb nearly as much capacity as longer trains. This is because the incremental time for a following train to proceed is related only to train lengths – train speed being equal. To illustrate, a two-mile long train moving at 60 MPH only takes one minute more than a one-mile long train to clear for a following move. Signal spacing is a function of permitted train speeds, train tonnage, braking system and topography, all of which are related to braking distance. Thus the distance between a stop (red) and clear (Green) signal can be several miles.

The business model we are considering is an intermodal facility located in Victorville, CA**.** Lying midway between the San Pedro Bay Ports and Victorville is the Cajon Pass. The BNSF rail line climbs the Pass on a grade exceeding 2.2%. Train speed is slow in both ascending and descending directions. This limits train throughput. As noted above long train lengths are not onerous relative to other operating considerations. This line is part of the transcontinental rail system of BNSF which stretches from Los Angeles to Chicago. By their nature, railroads have high fixed expenses and a need to maximize revenue. Short haul rail is low revenue relative to transcontinental movements, yet absorbs the same amount of capacity as long haul through the track segment it is operated. A cap on short haul rail revenue generation is by mode, where trucks tend to hold rates down and compete very effectively with rail. For reasons of limited revenue generation, most railroads will not offer short haul service. None of the scenarios outlined below are short haul service where there is not a continuation to long haul destinations. The short haul part of the service is to a point where intermediate work is performed.

Though this rail yard could service both western railroads, we will assume that BNSF is the main client for this facility. The model we use is that containers will be moved to the Victorville facility using existing on-dock rail facilities. We should note that the Port Master Plan estimates

that on-dock rail capacity will be reached at 30 percent of all TEUs. As noted previoulsy, 24 percent of port TEUs were loaded on-dock in 2006. These facts underscore the limited additional capacity at the on-dock intermodal facilities.

Following will be a presentation of possible scenarios for operating intermodal service into and out of Victorville including Department of Defense deployment of equipment.

3.1 Eastbound: San Pedro Bay Ports to Victorville

There are two potential markets for eastbound service to Victorville:

1. **Rail service to destinations east of California**. Service involves moving containers to the Victorville facility, performing the necessary work to create destination oriented trains, then transporting them eastward out of the state as described in (a) and (b) below. In the business model described in (b), the Victorville facility becomes an alternative to the Hobart yard in L.A. and the ICTF near dock rail facility, which are rapidly nearing capacity. Absent the creation of another near-dock rail facility at the SPB ports and without expansion of the ICTF, we can assume that the need for this type of service will be pressing by 2010 when the current facilities will be at capacity. There are two types of business models for consideration at Victorville and one is not mutually exclusive of the other.
    a. Multiple blocks are formed at multiple on-dock rail facilities and moved to Victorville where they are,switched and consolidated into solid destination trains for transport out of the state to hinterland destinations. (*This will be referred to as model EB1a*.)These trains would be 7500 feet long and comprised of 27, five well, forty foot double-stack cars. They would optimally carry up to 300 containers which includes a common port generated mix of 20’ and 40’ containers. This amounts to 540 TEUs where the weighted average container length is 1.80 TEU.
    b. “Leftover containers/ remains” are moved via rail shuttle to the Victorville facility. (*This will be referred to as model EB1b*.) These containers could represent the remains after one (or multiple) blocks are configured. These might also be containers to less common destinations where a terminal does not have enough containers to create a block in a reasonable interval of time. In both cases, it would take additional days to acquire enough additional containers to form a block, increasing dwell time at the terminal. As these containers will be assembled into blocks at the Victorville facility, there will be lift costs at the Victorville facility under this model that would not occur under model EB1a. The trains in this model will replicate the characteristics described in EB1a above

    Currently, containers that would be moved under model “a” primarily utilize on-dock rail and move through Los Angeles (via the Alameda corridor). Containers in model “b” are typically moved via dray to either the ICTF or Hobart facilities where they are integrated into a train. Both models currently in use are capacity constrained. Some observers believe that the on-dock rail loading facilities are capable of processing more than 30% of projected port teus, if containers are

loaded on rail cars randomly. In any event, additional intermodal capacity and/or changes to the current business model will have to be adjusted as demand exceeds the current supply of lift capacity. If on-dock can be used to load a single rail car with containers to multiple destinations, and thereby increase throughput, then model "b" has interesting ramifications for meeting the projected lift capacity shortfall. In addition model "b" as employed today requires a truck dray, whereas on-dock does not.

2. **Containers destined to the Victorville area.** (*This will be referred to as model EB2*.) This service involves moving containers by rail to the Victorville facility where they will be placed on chassis and moved via truck to nearby warehouse distribution centers, and transloading facilities. In this case, the Victorville facility will serve to reduce truck trips in and out of the SPB ports and reallocate truck movements to different freeways. Trains could be operated with mixed containers as described in 1 (b) above, 1) sorted, then transported east, 2) operated such that Victorville is the point of destination, or 3) a mixture or these two scenarios where the train has both types of traffic.. As described herein, the containers will be placed on rail at the on-dock facilities and moved via train without any sorting by destination at the marine terminal (other than Victorville as defined in routing instructions). This type of operation would require lifting the container from the rail car thus generating additional costs at the Victorville facility. This is in contrast to a truck dray which would leave a marine terminal without requiring a lift and go directly to a warehouse; or to a Victorville staged, long haul rail car where it would be lifted onto the car for transport to the hinterlands.

3.2 Westbound: Victorville to San Pedro Bay Ports

Victorville has the potential to process westbound port destined traffic in two ways.

1. Trains with blocks destined for multiple marine terminals could be yarded and switched at Victorville and reformulated into single destination trains. (*This will be referred to as model WB1.*) This business practice would provide the benefit of of reducing the number of storagae tracks in the port complex and lessen the switching inside the Port Complex. A recent port rail capacity study managed by the Port of Long Beach concluded that distributing multiple blocks of traffic to multiple marine terminals would not be possible if rail throughput goals are to be achieved. By 2015, this business practice would be unacceptable.

In this example, trains would be operated into the Victorville intermodal facility and the empty containers would be lifted from the rail cars and stored. This would free the rail cars for service which would not be the case if the cars were used to store the containers. The empty containers would subsequently be reloaded and forwarded to the marine terminals to coincide with ship schedules. The practical effect of this practice would be to improve marine terminal fluidity by eliminating the random arrival and storage of empties at the docks. At present, trains with empty containers are operated into the Port Complex without consideration for marine terminal congestion or ship schedules.

2. Westbound marine containers filled with domestic product could be unloaded at Victorville and trucked to warehouses in the Inland Empire. (*This will be referred to as model WB2.*) In calendar year 2006, more than 125,000 such containers were unloaded at BNSF's Hobart Yard, with many ultimately destined for the Inland Empire. This requires a significant truck backhaul over LA Basin freeways. If unloaded at Victorville, the containers could be trucked to nearby warehouse facilities, unloaded and returned to the port by truck. As additional warehouse and distribution centers are constructed at Victorville, rail service described herein should have a more significant positive impact on the LA Basin freeway service levels.

Models "WB1" and "WB2" in this section are types of approaches that could be used in the deployment of military equipment. Trains from multiple military bases, would be operated to Victorville where they would be switched and sequenced for departure according to ship stowage plans. This practice would require less ground storage in the marine terminals as the equipment could go direct from rail car to ship. Alternatively, equipment could be unloaded, ground stored or warehoused as required, and then reloaded for movement to a port of debarcation.

3.3 Shuttle Trains for Containers Destined for the Inland Empire

There is significant warehouse and distribution center space located in Riverside and San Bernardino counties. The current concentration of facilities is in the LA Basin part of the Inland Empire Counties. It is not deemed probable that a shuttle train would transport containers to Victorville destined for this market. The practical observation giving rise to the statement above is that the container would be over-hauled by 40-60 miles past its market destination by rail, then back-hauled the same amount of distance by truck dray. When made empty, it is probable that the containers would be drayed back directly to the port by truck rather than to Victorville. Going direct by truck from the ports to these destinations is the practical and cost effective way to serve this market (see distances below). Warehousing in the Victorville area of San Bernardino County is expected to increase rapidly if an intermodal facility were built there. In January of 2007, BNSF Railway announced that they are in discussions with the City of Victorville to construct a new intermodal facility at the former George Air Force Base.

The distances reported below are from city center to city center (calculations from mapquest.com).

- Long Beach to Victorville – 97.75 miles
- Long Beach to San Bernardino – 72.17 miles
- Long Beach to Riverside – 59.35 miles
- Victorville to San Bernardino – 40 miles
- Victorville to Riverside – 53 miles

It should be noted that San Bernardino county is the largest in the contiguous U.S. at over 52,000 kilometers-squared. The City of San Bernardino is in the Southwest portion of the county at the eastern edge of the LA Basin. Victorville is located in San Bernardino County at the top of the Cajon Pass, 40 miles to the northeast of the City of San

Bernardino. Interstate 15 connects the high desert (Victorville and east) part of the county with the LA Basin portion including much of Riverside County.

While we previously noted that it does not appear practical to shuttle containers via train to Victorville and then haul them 40-60 miles back to the LA Basin there is a scenario where one could construct an argument in support of this business model. That model would begin to make economic sense, once we factor in traffic congestion, especially in the future.

The route from Victorville to the cities of San Bernardino and Riverside would utilize Interstates 15 and 215. The route from POLB to Riverside or San Bernardino utilizes the already congested I-710 to connection with I-10 or SR 60 near downtown Los Angeles. The I-710 also connects with SR-91 which in turn connects to Interstate 15 and 215 in Riverside County. All of these freeways are congested with truck and automobile traffic. Many planners believe that future port-related congestion can be mitigated by moving containers to the eastern part of the region by rail. By moving containers inland by rail the congested I-710 would have more capacity to move containers to the warehouse cluster in Los Angeles and adjacent cities. Thus moving Inland Empire destined containers to Victorville for final distribution would disperse them to other parts of the greater Los Angeles Region freeway grid (see the map in Appendix A for the regional road system from SPB Ports to Victorville).

4.0 FORECASTING FUTURE MARKET SIZE AND CAPTURING MARKET SHARE

It is axiomatic that freight flows like water seeking its course, and shippers are a generation ahead of surface transportation planners. Look no further than the Alameda Corridor project experience and the emergence of transloading as phenomenon, all of which makes future market share forecasting unpredictable given the range of distribution lane alternatives that will be available to shippers in the future. There are several planned additions to main line rail and intermodal facility capacity on the drawing board. One thing that is certain is that a third main line is being added to the Cajon Pass reducing a major choke point on eastbound rail movement through the region. No one can predict if all of theses will be completed. Collectively they will influence the path but not the ultimate necessity for an intermodal rail facility at SCLA Victorville.

From today's perspective aggregating the figures on import container moves by mode, 42 percent of freight moves by intermodal rail directly from the on-dock, near-dock and off-dock facilities. About 13 percent of the marine cargo is transloaded and then drayed to a rail facility for further transport. returns to. Twenty-five percent moves via local trucking, and 20 percent via regional trucking. The long-haul rail portion transloaded at local facilities is included in the local truck market percentages.

If the current distribution of modes is assumed constant, we can combine this information with the Ports' projections on growth to estimate the amount of containers moving via different modes. The figures below are projected inbound loaded TEUs and containers by mode.

Mode	Percent	2010		2020		2025	
		TEUs	Containers	TEUs	Containers	TEUs	Containers
Intermodal Rail	42%	4.095	2.75	5.954	3.308	8.253	4.585
Regional Trucking	20%	1.95	1.083	2.835	1.575	3.93	2.183
Local Trucking	23%	2.243	1.246	3.260	1.811	4.520	2.511
Transloaded	15%	1.463	0.813	2.126	1.181	2.948	1.638

Source: CCDoTT, 2006; authors' calculations
* 1 container = 1.80 TEUs

Figure 4: Volumes by mode based on projections (in millions)

Since the proposed site at Victorville is designed to alleviate some pressures from existing and planned rail facilities, we assume the potential short run market is for regionally trucked freight, transloading and intermodal rail beyond the existing capacity. Local freight would not be appropriate for this business plan as there is little gained by moving it east.

The Port Master Plan predicts that by 2015 Hobart will backfill with domestic boxes filled with imported goods that have been transloaded or locally warehoused before being transported east. We also assume that near dock rail facilities will reach capacity by 2010 if there is no expansion of existing facilities (ICTF) or the creation of a new near dock facility (SCIG). If these facilities are built, they will add 2.275 million lifts and reach capacity in 2020.

There will be a shortfall in intermodal capacity in 2020 even if plans to build additional I/M capacity is met. The San Pedro Bay Ports Draft Rail Master Planning Study estimates that the on-dock rail facilities (if all are constructed) will be capable of handling 30 percent of all port traffic. This leaves 12 percent of the TEUs moving by rail to be accounted for. With a forecast of 36 million TEUs in 2020, the implication is that 4.32 million TEUs (2.4 million containers) will need to be loaded outside the port. Given that ICTF will be at capacity with 760,000 containers (current volume 726,000), and Hobart will be full with about 800,000 international containers, we calculate a lift capacity shortfall of 840,000 containers. As noted earlier, the Port Master Plan projects a need to convert all of the Hobart capacity to domestic traffic by 2015. If so, and no new near-dock facilities are constructed or expanded, there will be a 1.6 million container lift shortfall in 2020 as Hobart Yard will not load any import traffic under this scenario. Embedded in the on-dock loading capacity are a lot of assumptions that many observers think to be overly optimistic. If the skeptics are proven to be correct and a lesser percentage of port traffic is loaded on-dock, and if no new near-dock capacity is constructed the implications are even more profound. One obvious scenario, which will be part of the "no-build" consequences if SCIG is not constructed, is a truck haul to Victorville or Barstow, where the container will be loaded on a rail car.

5.0 COMPETITIVENESS ANALYSIS: COST OF INLAND RAIL SHUTTLE

For some but not all distribution lanes a rail shuttle operation must compete with inland dray costs which may also rise in the future when the full cost of environmental compliance is internalized by truck operators.

The cost model for the inland rail shuttle assumes that trains can run on existing BNSF track and will use excess capacity on this track, a reasonable assumption given our initial business model of moving 10 trains per day to the inland facility (which involves 20 trips including equipment repositioning) Running shuttles 280 days per year would result in 840,000 containers (1.512 million TEUs) moved. Thus, this service could potentially carry over 10 percent of the inbound containers of LA and LB by 2010.

The cost is decomposed below. We assume capacity exists to move 10 trains, which means the cost of capital of expanding current track is not included.

We first present the estimated cost components of the rail shuttle with units of measure indicated. These figures are adapted from work done by ACTA, SCAG, and R1 filings of the Class I Railroads as well as the report, "Rail Short Haul Intermodal Corridor Case Studies" (Foundation for Intermodal Research and Education, March 2003). All figures were inflated to 2006 dollars using the rail industry producer price index (PPI) available from the Bureau of Labor Statistics. In addition, the current price of diesel was obtained from Department of Energy statistics.

Cost Components

- On-dock lift: $100 per container.
- Alameda corridor: $18.04 per TEU for a full container; $4.57 per TEU for an empty container.
- Train mile cost (for dispatching,etc.): $4.483 per train mile
- Crew wages: $10.8331 per train mile.
- Maintenance of way: $1.1172 per 1000 ton-miles
- Locomotive Maintenance: $1.4859 per unit mile.
- Fuel cost: $2.76 per gallon.
- Locomotive Ownership: $44.45 per hour.
- Car Costs: $57.6072 per car per day + $0.08636 per car per mile
- Victorville lift cost: $40 per container

We make the following assumptions regarding the structure of the train:

- Trains are 7500 feet in length, requiring 5 locomotives for the eastbound trip and 4 locomotives for the westbound trip.
- Trains consist of 27 five unit double-stack cars,with a capacity of 270 FEU.
- The expected train weight is 7200 tons for the eastbound trip and 6000 tons for the westbound trip.
- The one way distance is 100 miles
- Fuel usage is 3 gallons per mile

- The lift cost at Victorville only applies to westbound containers used in business model 2 and applies to all eastbound containers.

Final calculations are based on these additional assumptions

- 1 container = 1.8 TEUs
- locomotives can make a one-way trip in 12 hours
- rail cars are used for 2 days in a one way trip (to allow time for trains to be constructed and equipment repositioning).
- The buffer of cars necessary due to maintenance and other factors is 10 percent.
- The buffer of locomotives necessary is 20% (one additional locomotive).
- Long run break even price is equal to 1.4 times the average total cost per container mile.

Cost Element	Cost	Unit of Measure	Cost Per Train	Average Cost Per Container
Train Mile (dispatching, etc)	$4.4831	train mile	$448.3100	$1.4944
Crew Wages	$10.8331	train mile	$1,083.3100	$3.6110
Maintenance of Way	$1.1176	per 1000 ton miles	$804.6720	$2.6822
Locomotive Maintenance	$1.4859	unit mile	$742.9500	$2.4765
Fuel Cost	$2.7600	per gallon	$1,380.0000	$4.6000
Locomotive Ownership	$44.4500	per hour per locomotive	$640.0800	$2.1336
Car Costs	$57.6072	per car per day	$3,421.8677	$11.4062
	$0.0864	per car per mile	$43.1800	$0.1439
Terminal Cost/ lift	$100.0000	per container	$30,000.0000	$100.0000
ACTA	$18.0400	full TEU	$9,741.6000	$32.4720
		Total cost per train	$48,305.9697	
		Cost per container	$161.0199	
		Cost per container per mile	$1.6102	
		LR Price per Container Mile	$2.2543	

Figure 5: Table of Costs for Eastbound Traffic Used in Business Models EB1a and EB1b

Element	Cost	Unit of Measure	Cost Per Train	Average Cost Per Container
Train Mile (dispatching, etc)	$4.4831	train mile	$448.3100	$1.4944
Crew Wages	$10.8331	train mile	$1,083.3100	$3.6110
Maintenance of Way	$1.1176	Per 1000 ton miles	$804.6720	$2.6822
Locomotive Maintenance	$1.4859	Per unit per mile	$742.9500	$2.4765
Fuel Cost	$2.7600	per gallon	$1,380.0000	$4.6000
Locomotive Ownership	$44.4500	Per unit per hour	$640.0800	$2.1336
Car Costs	$57.6072	per car	$3,421.8677	$11.4062
	$0.0864	per car per mile	$43.1800	$0.1439
Terminal Cost/ lift	$100.0000	Per container	$30,000.0000	$100.0000
Dray Costs	$200.0000	per container	$60,000.0000	$200.0000
ACTA	$18.0400	Per full TEU	$9,741.6000	$32.4720
		Total Cost	$108,305.9697	
		Cost Per Container	$361.0199	
		Cost Per Container Mile	$3.6102	
		LR Price Per Container Mile	$5.0543	

Figure 6: Table of Costs for Eastbound Traffic Used in Model EB2

Element	Cost	Unit of Measure	Cost Per Train	Average Cost Per Container
Train Mile (dispatching, etc)	$4.4831	Train mile	$448.3100	$1.4944
Crew Wages	$10.8331	Train mile	$1,083.3100	$3.6110
Maintenance of Way	$1.1176	Per 1000 ton miles	$670.5600	$2.2352
Locomotive Maintenance	$1.4859	Per Unit per mile	$594.3600	$1.9812
Fuel Cost	$2.7600	per gallon	$1,380.0000	$4.6000
Locomotive Ownership	$44.4500	per unit per hour	$640.0800	$2.1336
Car Costs	$57.6072	per car	$3,421.8677	$11.4062
	$0.0864	per car per mile	$43.1800	$0.1439
Terminal Cost/ lift	$100.0000	per container	$30,000.0000	$100.0000
Victorville Lift	$40.0000	per container	$12,000.0000	
ACTA	$4.5700	Per empty TEU	$2,467.8000	$8.2260
		Total Cost per Train	$52,749.4677	
		Cost Per Container	$175.8316	
		Cost Per Container Mile	$1.7583	
		LR Price Per Container Mile	$2.4616	

Figure 7: Table of Costs for Westbound Traffic Used in Model WB1

5.1 Discussion of the Cost of Rail Shuttle by Business Model

The cost per container is split into the three potential models for easttbound container movements. Models EB1a and EB1b involve sending blocks of containers destined for locations east of California through the Victorville site and send “remains” (containers that do not fit into a block) to Victorville to be consolidated into blocks destined for locations east of California. Both of these models have a cost per container of $161, with an estimated long run price per container of $225.

Model EB2 involves sending containers destined for locations in San Bernardino or Riverside Counties to Victorville via rail and then dray to final destination. The cost per container is $361, with a long run estimated price of $505.

What is clear is that the rates charged for the eastbound traffic must subsidize to some extent the westbound movement of containers (primarily empty containers) to the SPB ports (model WB1). This cost is estimated as $175, with a long run estimated price of $246. If 50 percent of the price of this assigned to the eastbound rate, the prices would increase to $348 for business models EB1a and EB1b and $628 for business model EB2. This would make the price of the rail shuttles involving blocks of containers comparable to current dray rates, however, would make

business model EB2 economically infeasible at current prices for rail and truck. Due to similar cost concerns, model WB2 is not considered economically viable under the current scenarios.

6.0 CONCLUSIONS AND RECOMMENDATIONS

International trade and regional population driven growth in import container traffic through Southern California are inevitable under current and foreseeable future economic conditions. Accommodating future growth requires a solution set that includes maximum utilization and synchronization of on and near dock, and main line, intermodal rail capacity for containers destined for markets east of the Los Angeles Basin. Doubling or even tripling current throughput capacity currently around 14 million twenty-foot equivalent units (TEU's) is not beyond current forecasts. There will be an intermodal rail ramp located at the site of the former George Air Force Base located in Victorville, California now re-designated the Southern California Logistics Airport (SCLA) complex administered by a regional Joint Powers Agency.

Strategic Mobility 21 (SM 21) has been invited to use that facility as a prototype dual military and commercial use facility for both rapid deployment of military units following mission rehearsal rotation at the National Training Center at Fort Irwin, Barstow, California or the 29 Palms Marine Air Ground Training Facility at 29 Palms, California, as well as serving as a logistics buffer or congestion relief valve for regional main line rail capacity in both an intermodal and domestic transload trade lane capacity.

This study provides a preliminary economic and operational analysis, including business and economic cost models, for such a commercial operation which the Department of Defense could leverage for rapid deployment and agile sustainment purposes. Additional simulation and modeling studies using joint deployment and Southern California Agile Supply Network (SCASN) modeling purposes to provide greater fidelity for economic tradeoff analysis, as well as quantify and validate the results of these preliminary conclusions over time for pubic policy and surface transportation infrastructure investment purposes.

The supporting microeconomic Value Stream Analysis can further support the conclusions reached in the context of on or near dock rail, regional dwell and demurrage policies, and scheduling and appointment systems for local intermodal dray operations.

This is but the first in planned series of SM21 intermodal studies intended to help shape the development of the SCLA complex as a national dual use advanced logistics prototype to be eventually linked as a single operating network for goods movement synchronization purposes.

GLOSSARY

Terminology	Definition
TEU	Twenty Foot Equivalent Unit
ICTF	Intermodal Container Transfer Facility
UPRR	Union Pacific Railroad
SCIG	Southern California International Gateway
BNSF	Burlington Northern Santa Fe Railroad
POLB	Port of Long Beach
POLA	Port of Los Angeles
SPB	San Pedro Bay
I/M	Intermodal

REFERENCES

"BNSF Railway Class I Railroad Annual Report to the Surface Transportation Board for the Year Ending December 31, 2005."

Casgar, Christina S., David J. DeBoer, and David L. Parkinson, "Rail Short Haul Intermodal Corridor Case Studies: Industry Context and Issues." Foundation for Intermodal Research and Education, March, 2003.

Center for the Commercial Deployment of Transportation Technologies, "Marketing Study Phase I: MAGLEV Market Sizing and Operational Model." May, 2006.

Husing, John, "Logistics Employment Growth, Inland Empire, 1990-2005".

Parsons, "San Pedro Bay Ports Draft Rail Master Planning Study Update." Prepared for the Ports of Long Beach and Los Angeles, October, 2006.

"Growth of California Ports: Opportunities and Challenges", A Report to the California State Legislature, April, 2007.

"Final California Goods Movement Action Plan", California Department of Business, Transportation and Housing, January, 2007.

Council of Supply Chain Management Professionals, "16th Annual Logistics Report".